Appendix H
Glossary

Abnormal Environment

Those environments as defined in a weapon's stockpile-to-target sequence and military characteristics in which the weapon is not expected to retain full operational reliability.

Active Defense

The employment of limited offensive action and counterattacks to deny a contested area or position to the enemy.

Alteration (Alt)

A material change to, or a prescribed inspection of, a nuclear weapon or major assembly that does not alter its operational capability but is sufficiently important to the user (regarding assembly, maintenance, storage or test operations) as to require controlled application and identification

Atom

The smallest (or ultimate) particle of an element that still retains the characteristics of that element. Every atom consists of a positively charged central nucleus, which carries nearly all the mass of the atom, surrounded by a number of negatively charged electrons, so that the whole system is electrically neutral.

Atomic Bomb (A-Bomb)

A term sometimes applied to a nuclear weapon utilizing fission energy only.

Atomic Mass Number

The number of protons in the nucleus of an atom.

Authorization

Legislation that establishes, changes or continues a federal program or agency. Authorizing legislation is normally a prerequisite for appropriations. For some programs, primarily entitlements, the authorizing legislation itself provides the authority to incur obligations and make payments. Like Appropriations Acts, authorizing legislation must be passed by both Houses of Congress and must be signed by the President to become law.

Ballistic Missile

Any missile which does not rely upon aerodynamic surfaces to produce lift and consequently follows a ballistic trajectory when thrust is terminated.

Blast Wave

A sharply defined wave of increased pressure rapidly propagated through a surrounding medium from a center of detonation or similar disturbance.

Component

An assembly or any combination of parts, subassemblies, and assemblies mounted together in manufacture, assembly, maintenance, or rebuild.

Criticality

A term used in reactor physics to describe the state when the number of neutrons released by fission is exactly balanced by the neutrons being absorbed (by the fuel and poisons) and escaping the reactor core. A reactor is

said to be "critical" when it achieves a self-sustaining nuclear chain reaction, as when the reactor is operating.

Critical Mass

The minimum amount of fissionable material capable of supporting a chain reaction under precisely specified conditions.

Cruise Missile

Guided missile, the major portion of whose flight path to its target is conducted at approximately constant velocity; depends on the dynamic reaction of air for lift and upon propulsion forces to balance drag.

Defense Acquisition System

The Defense Acquisition System is the management process that guides all DoD acquisition programs. DoD Directive 5000.1, The Defense Acquisition System, provides the policies and principles that govern the defense acquisition system. DoD Instruction 5000.2, Operation of the Defense Acquisition System, in turn establishes the management framework that implements these policies and principles.

Defense Planning Guidance (DPG)

This document, issued by the Secretary of Defense, provides firm guidance in the form of goals, priorities, and objectives, including fiscal constraints, for the development of the Program Objective Memorandums by the Military Departments and Defense agencies.

Design Review and Acceptance Group (DRAAG)

A group, which usually consists of the Lead Project Officer (LPO) from the lead Service plus one representative from each affected Military Service. The DRAAG findings on a new nuclear weapon design (or refurbishment design) are forwarded through the lead Service to the NWCSSC for approval to progress to the next phase.

Deuterium

An isotope of hydrogen of mass 2 units; it is sometimes referred to as heavy hydrogen.

Dynamic Pressure

The air pressure which results from the mass air flow (or wind) behind the shock front of a blast wave.

Electromagnetic Hardening

Action taken to protect personnel, facilities, and/or equipment by filtering, attenuating, grounding, bonding, and/or shielding against undesirable effects of electromagnetic energy.

Electromagnetic Pulse (EMP)

The electromagnetic radiation from a strong electronic pulse, most commonly caused by a nuclear explosion that may couple with electrical or electronic systems to produce damaging current and voltage surges.

Electron

A particle of very small mass, carrying a unit negative or positive charge.

Element

One of the distinct, basic varieties of matter occurring in nature which, individually or in combination, compose substances of all kinds.

Expenditure

Charges against available funds. An expenditure results from a voucher,

claim, or other document approved by competent authority. Expenditures represent the presentation of a check or electronic transfer of funds to the performer of work.

Fallout

The precipitation to Earth of radioactive particulate matter from a nuclear cloud; also applied to the particulate matter itself.

Fireball

The luminous sphere of hot gases which forms a few millionths of a second after detonation of a nuclear weapon and immediately starts expanding and cooling.

Fissile

Capable of being split by slow (low-energy) neutrons as well as by fast (high-energy) neutrons. Uranium-235 and plutonium-239 are fissile materials.

Fission

The process whereby the nuclear of a particular heavy element splits into (generally) two nuclei of lighter elements, with the release of substantial amounts of energy. The most important fissionable materials are uranium-235 and plutonium 239; fission is caused by the absorption of neutrons.

Flag-level

A term applied to an officer holding the rank of general, lieutenant general, major general, or brigadier general in the U.S. Army, Air Force or Marine Corps or admiral, vice admiral, or rear admiral in the U.S. Navy or Coast Guard.

Flash Blindness

Impairment of vision resulting from an intense flash of light. It includes temporary or permanent loss of visual functions and may be associated with retinal burns.

Fusion

The process whereby the nuclei of light elements, especially those of the isotopes of hydrogen, namely, deuterium and tritium, combine to form the nuclear of a heavier element with the release of substantial amounts of energy.

Gamma Rays

Electromagnetic radiations of high photon energy originating in atomic nuclei and accompanying many nuclear reactions (e.g., fission, radioactivity, and neutron capture).

Gun Assembly (GA) Weapon

A device in which two or more pieces of fissionable material, each less than a critical mass, are brought together very rapidly so as to form a supercritical mass that can explode as the result of a rapidly expanding fission chain.

Half-life

The time required for the activity of a given radioactive species to decrease to half of its initial value due to radioactive decay.

Hydrogen Bomb (H-Bomb)

A term sometimes applied to nuclear weapons in which part of the explosive energy is obtained from nuclear fusion (or thermonuclear) reactions.

Ignition

In theory the conditions required to heat and compress a fuel of deuterium and tritium to pressures and

temperatures that will ignite and burn the fuel to produce an energy gain.

Implosion Assembly (IA) Weapon

A device in which a quantity of fissionable material, less than a critical mass, has its volume suddenly decreased by compression, so that it becomes supercritical and an explosion can take place.

Incident Command System

A standardized on-scene emergency management organization that reflects the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries. The incident command system is the combination of facilities, equipment, personnel, procedures, and communications operating with a common organizational structure, designed to aid in the management of resources during incidents. The incident command system is used for all kinds of emergencies and is applicable to small as well as large and complex incidents. The incident command system is used by various jurisdictions and functional agencies, both public and private, or organized field level incident management operations.

Incident of National Significance

An actual or potential high-impact event that requires a coordinated and effective response by and appropriate combination of federal, state, local, tribal, nongovernmental, and/or private-sector entities in order to save lives and minimize damage, and provide the basis for long-term community recovery and mitigation activities.

Induced Radiation

Radiation produced as a result of exposure to radioactive materials, particularly the capture of neutrons.

Initial Radiation

The radiation, essentially neutrons and gamma rays, resulting from a nuclear burst and emitted from the fireball within one minute after burst.

Ion

An atom that has gained or lost an electron and thus carries an electrical charge.

Joint Integrated Project Plan (JIPP)

The baseline control document for the weapon refurbishment activity. It discusses the following issues, where applicable: Refurbishment scope; Design definition; Project schedule, including joint DoD/NNSA milestones, planned management briefings and reviews as well as certification schedules; Cost analyses; Change control; Certification process definition; MCs, Stockpile-to-Target Sequence (STS) and Interface Control Document (ICD) changes; System MOUs between the DoD and the NNSA; Stockpile evaluation planning; Operational safety implications (integrated safety process); Proposed changes to Technical Publications; Trainers and weapon-type requirements; Spares, handling gear, use control equipment, tools, gauges and testers; Development testing and modeling support requirements; Process development and product qualification; Archiving and lessons learned; Component/material characterization for disposition; Product delivery (components and

documents); Risk management; and Classification review.

Life-cycle

The total phases through which an item passes from the time it is initially developed until the time it is either consumed in use or disposed of as being excess to all known materiel requirements.

Limited Life Component (LLC)

A weapon component that decays with age and must be replaced periodically.

Major Assembly Release (MAR)

A statement prepared and signed by Sandia National Laboratories (SNL) and either Los Alamos National Laboratory (LANL) or Lawrence Livermore National Laboratory (LLNL) that is approved and transmitted to the DoD by the NNSA. The MAR states that War Reserve (WR) weapons material is satisfactory for release to the DoD on a specific date and for specific uses, which may be qualified by exceptions and limitations.

Military Characteristics (MCs)

Those characteristics of equipment upon which depends its ability to perform desired military functions. Military characteristics include physical and operational characteristics but not technical characteristics.

Modification (Mod)

A change to a major assembly which alters its operational capabilities. This kind of change involves the user and requires positive control to ensure that the operational capability is clearly defined. A Mod is also defined as a change in operational capability that results from a design change which affects delivery (employment or utilization), fusing, ballistics or logistics.

Munition

A complete device charged with explosives, propellants, pyrotechnics, initiating composition, or nuclear, biological, or chemical material for use in military operations, including demolitions. Certain suitably modified munitions can be used for training, ceremonial, or nonoperational purposes. Also called ammunition. (Note: In common usage, "munitions" [plural] can be military weapons, ammunition, and equipment.)

National Security

A collective term encompassing both national defense and foreign relations of the United States. Specifically, the condition provided by: a. a military or defense advantage over any foreign nation or group of nations; b. a favorable foreign relations position; or c. a defense posture capable of successfully resisting hostile or destructive action from within or without, overt or covert.

Neutron

A neutral particle (i.e., with no electrical charge) of approximately unit mass, present in all atomic nuclei, except those of ordinary (light) hydrogen.

Nonproliferation (NP)

Those actions (e.g., diplomacy, arms control, multilateral agreements, threat reduction assistance, and export controls) taken to prevent the proliferation of weapons of mass destruction by dissuading or impeding

access to, or distribution of, sensitive technologies, material, and expertise.

Normal Environment

The expected logistical and operational environments as defined in a weapon's stockpile-to-target sequence and military characteristics which the weapon is required to survive without degradation in operational reliability.

Nuclear Radiation

Particulate and electromagnetic radiation emitted from atomic nuclei in various nuclear processes. The important nuclear radiations, from the weapon standpoint, are alpha and beta particles, gamma rays, and neutrons. All nuclear radiations are ionizing radiations, but the reverse is not true; X-rays for example, are included among ionizing radiations, but they are not nuclear radiations since they do not originate from atomic nuclei.

Nuclear Weapon

A complete assembly (i.e., implosion, gun, or thermonuclear), in its intended ultimate configuration which, upon completion of the prescribed arming, fusing, and firing sequence, is capable of producing the intended nuclear reaction and release of energy.

Nuclear Weapon Surety

Procedures and actions contributing to the physical security of nuclear weapons, and to the assurance that there will be no nuclear weapon accidents, incidents, or unauthorized weapon detonations, nor any degradation of weapon performance over target.

Nuclear Weapon System Safety Group (NWSSG)

A group that conducts the Preliminary Safety Study and follow-on Safety Studies that identify safety-related concerns and deficiencies so that corrections may be made in a timely and cost-efficient manner. The NWSSG develops the Weapon System Safety Rules.

Nuclear Yields

The energy released in the detonation of a nuclear weapon, measured in terms of the kilotons or megatons of trinitrotoluene required to produce the same energy release.

Yields are categorized as follows:

very low — less than 1 kiloton;

low — 1 kiloton to 10 kilotons;

medium — over 10 kilotons to 50 kilotons;

high — over 50 kilotons to 500 kilotons;

very high — over 500 kilotons.

Nucleus

The small, central, positively charged region of an atom which carries essentially all the mass. Except for the nuclear of ordinary (light) hydrogen, which is a single proton, all atomic nuclei contain both protons and neutrons.

One-Point Safe

A nuclear weapon is one-point safe if, when the high explosive (HE) is initiated and detonated at any single point, the probability of producing a nuclear yield exceeding four pounds of TNT equivalent is less than 1 in 10.

Operational Security

A process of identifying critical information and subsequently analyzing friendly actions attendant to

military operations and other activities to: a. identify those actions that can be observed by adversary intelligence systems; b. determine indicators that adversary intelligence systems might obtain that could be interpreted or pieced together to derive critical information in time to be useful to adversaries; and c. select and execute measures that eliminate or reduce to an acceptable level the vulnerabilities of friendly actions to adversary exploitation.

Overarching Integrated Product Team (OIPT)

A DoD Study Group that researches advanced weapons or defense-related concepts. When nuclear weapons are involved, this Team is responsible for informing the NWCSSC prior to initiating jointly-coordinated DoD/NNSA Phase 6.X activities.

Peak Overpressure

The maximum value of overpressure at a given location which is generally experienced at the instant the shock (or blast) wave reaches that location.

Penetration Capability

In land operations, a form of offensive which seeks to break through the enemy's defense and disrupt the defensive system.

Project Officers Groups (POGs)

The POGs are joint DoD-NNSA groups associated with each warhead-type, created at the beginning of a weapon development program and charged with the responsibility to coordinate the development and assure the compatibility of a warhead-type with its designated delivery system(s).

Prompt Radiation

The gamma rays produced in fission and as a result of other neutron reactions and nuclear excitation of the weapon materials appearing within a second or less after a nuclear explosion. The radiations from these sources are known either as prompt or instantaneous gamma rays.

Proton

A particle of mass (approximately) unity carrying a unit positive charge; it is identical physically with the nuclear of the ordinary (light) hydrogen atom. All atomic nuclei contain protons.

Quadrennial Defense Review

Title 10, Section 118 of the United States Code specifies: "The Secretary of Defense shall every four years, during a year following a year evenly divisible by four, conduct a comprehensive examination (to be known as a "quadrennial defense review") of the national defense strategy, force structure, force modernization plans, infrastructure, budget plan, and other elements of the defense program and policies of the United States with a view toward determining and expressing the defense strategy of the United States and establishing a defense program for the next 20 years. Each such quadrennial defense review shall be conducted in consultation with the Chairman of the Joint Chiefs of Staff."

Quality Assurance and Reliability Testing

A quality assurance program that is part of a joint DoD-DOE stockpile evaluation program. It consists of nonnuclear laboratory and flight tests and nuclear component evaluations

essential in detecting problems in components that affect assessments for warhead safety validation and qualified reliability estimates. It consumes a number of warheads from the stockpile each year.

Quality Assurance and Reliability Testing (QART) Replacement Warheads

Warheads retained in the inactive stockpile to replace Active Stockpile Warheads withdrawn for the Quality Assurance and Reliability Testing program.

Quantification of Margins and Uncertainties (QMU)

A collection of methods that rest on three key elements, with the goal of supporting nuclear-stockpile decision making under uncertainty. The elements stress stockpile life-cycle performance characteristics and are summarized as follows:

Element 1: Identification and specification of performance threshold(s)

Element 2: Identification and specification of associated performance margin(s), that is, measure(s) of exceeding performance thresholds

Element 3: Quantified uncertainty in threshold and margin specifications

QMU quantifies the three major elements (hence, the presence of the word "Quantitative" in QMU) and produces numbers, random variables, or some other more general measures of uncertainty.

Radioactivity

The spontaneous emission of radiation, generally alpha or beta particles, often accompanied by gamma rays, from the nuclei of an (unstable) isotope. As a result of this emission, the radioactive isotope is converted (or decays) into the isotope of a different (daughter) element which may (or may not) also be radioactive. Ultimately, as a result of one or more stages of radioactive decay, a stable (nonradioactive) end product is formed.

Readiness

The ability of U.S. military forces to fight and meet the demands of the national military strategy. Readiness is the synthesis of two distinct but interrelated levels.

a. unit readiness — The ability to provide capabilities required by the combatant commanders to execute their assigned missions. This is derived from the ability of each unit to deliver the outputs for which it was designed.

b. joint readiness — The combatant commander's ability to integrate and synchronize ready combat and support forces to execute his or her assigned missions.

Refurbishment

Refurbishment refers to all nuclear weapons alterations and modifications including life extensions, modernizations and revised military requirements. These refurbishments are assigned a new alteration or modification number for stockpile management purposes.

Reliability

There is no official definition for the term reliability. To enhance accuracy and avoid inconsistencies, the following are three different definitions of reliability, which are provided by

Sandia National Laboratories (SNL), Los Alamos National Laboratory (LANL) and Lawrence Livermore National Laboratory (LLNL) and the Joint Nuclear Weapons Publication System (JNWPS).

The probability of achieving at least the desired yield at the target across the Stockpile-to-Target Sequence environments throughout the weapon's lifetime. (SNL)

The probability that, in use, detonation at the specified yield will occur at the target through either the primary or any backup modes of operation. (LANL and LLNL)

The probability, without regard to countermeasures, that a nuclear weapon, subassembly, component, or other part will perform in accordance with its design intent or requirements. Statements of functionability, as well as dud or other failure probabilities, are included. (JNWPS)

Reliability Replacement Warheads

Warheads retained in the inactive stockpile that provide the assets to replace Active Stockpile Warheads should reliability or safety problems develop.

Residual Radiation

Nuclear radiation caused by fallout, artificial dispersion of radioactive material, or irradiation which results from a nuclear explosion and persists longer than one minute after burst.

Rupture Zone

The region immediately adjacent to the crater boundary in which the stresses produced by the explosion have exceeded the ultimate strength of the medium. It is characterized by the appearance of numerous radial cracks of various sizes.

Security

A condition that results from the establishment and maintenance of protective measures that ensure a state of inviolability from hostile acts or influences.

Shock Front

The fairly sharp boundary between the pressure disturbance created by an explosion (in air, water, or earth) and the ambient atmosphere, water, or earth, respectively. It constitutes the front of the shock (or blast) wave.

Staged Weapon

A weapon in which energy from its primary initiates the explosion of a secondary.

Stockpile Flight Test (SFT)

Joint DOE-DoD flight tests conducted periodically on weapon systems randomly selected from the stockpile.

Stockpile-to-Target Sequence (STS)

1. The order of events involved in removing a nuclear weapon from storage and assembling, testing, transporting, and delivering it on the target.

2. A document that defines the logistic and employment concepts and related physical environments involved in the delivery of a nuclear weapon from the stockpile to the target. It may also define the logistic flow involved in moving nuclear weapons to and from the stockpile for quality assurance testing, modification and retrofit, and the recycling of limited life components.

Subcritical

The state of a given fission system when the specified conditions are such that a less than critical mass of active material is present.

Supercritical Mass

The quantity of fissionable material needed to support a multiplying chain reaction.

Surety

From Nuclear Matters: A Practical Guide:

There is no universally accepted definition of the term nuclear weapons surety. For the purpose of this handbook, surety can be defined as the safety, security and use control of nuclear weapons.

From JP 1-02:

Materiel, personnel, and procedures that contribute to the security, safety, and reliability of nuclear weapons and to the assurance that there will be no nuclear weapon accidents, incidents, unauthorized weapon detonations, or degradation in performance at the target.

Thermal Radiation

1. The heat and light produced by a nuclear explosion.

2. (DoD only) Electromagnetic radiations emitted from a heat or light source as a consequence of its temperature; it consists essentially of ultraviolet, visible, and infrared radiations.

Thermonuclear

An adjective referring to the process (or processes) in which very high temperatures are used to bring about the fusion of light nuclei with the accompanying release of energy.

Thermonuclear Weapon

A weapon in which very high temperatures are used to bring about the fusion of light nuclei such as those of hydrogen isotopes (e.g., deuterium and tritium) with the accompanying release of energy. The high temperatures required are obtained by means of fission.

TNT Equivalent

A measure of the energy released from the detonation of a nuclear weapon, or from the explosion of a given quantity of fissionable material, in terms of the amount of TNT (trinitrotoluene) which could release the same amount of energy when exploded.

Transient Radiation Effects on Electronics (TREE)

Effects on electronics that are exposed to transient gammas, neutrons, and X-rays.

Tritium

A radioactive isotope of hydrogen, having a mass of 3 units; it is produced in nuclear reactors by the action of neutrons on lithium nuclei.

Two-Person Control

The continuous surveillance and control of positive control material at all times by a minimum of two authorized individuals, each capable of detecting incorrect or unauthorized procedures with respect to the task being performed and each familiar with established security requirements.

Underground Burst

The explosion of a nuclear (or atomic) weapon with its center more than

5W0.3 feet, where W is the explosion yield in kilotons, beneath the surface of the ground.

Underwater Burst

The explosion of a nuclear (or atomic) weapon with its center beneath the surface of the water.

Use Control

The positive measures that allow the authorized use and prevent or delay unauthorized use of nuclear weapons. Use control is accomplished through a combination of weapon system design features, operational procedures, security, and system safety rules.

U.S. Nuclear Weapons Program

The totality of all activities, processes, and procedures associated with the design, development, production, fielding, maintenance, repair, storage, transportation, physical security, employment, dismantlement, disposal, and replacement of the nuclear weapons in the U.S. stockpile.

Warhead

That part of a missile, projectile, torpedo, rocket, or other munitions which contains either the nuclear or thermonuclear system, high explosive system, chemical or biological agents, or inert materials intended to inflict damage.

Weapon Storage Vault (WSV)

A below ground, surface flush structure for storage of various types of nuclear weapons. The weapon storage vault provides enhanced hardened storage against both security and survivability threats and provides for rapid weapon outload.

Weapon System

A combination of one or more weapons with all related equipment, materials, services, personnel, and means of delivery and deployment (if applicable) required for self-sufficiency.

X-ray

Electromagnetic radiations of high energy having wavelengths shorter than those in the ultraviolet region. Materials at very high temperatures (millions of degrees) emit such radiations; they are then called thermal X-rays.

Yield

The total effective energy released in a nuclear (or atomic) explosion. It is usually expressed in terms of the equivalent tonnage of TNT required to produce the same energy release in an explosion.